SUPER®

AOC-SG-i2

USER'S GUIDE

Rev. 1.0

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Introduction

Overview

This manual is written for system integrators, PC technicians and knowledgeable PC users who intend to integrate SuperMicro's AOC-SG-i2 Add on Card to their system.

Product Features

The AOC-SG-i2 offers the following features:

- Dual Intel 82575EB1 LAN chips
- PCI-e x4 interface
- Low-profile, half-length PCI-e x4 standard card
- Two ports that maximize connectivity in small spaces through RJ45 connectors
- Jumbo frames support up to 9.5KB packets
- Intel's I/OAT accelorates I/O with higher throughput and lower CPU utilzation
- Virtualization provides the platform with port density required for virtualized environments
- Support Pre-boot Execution Environment (PXE) on Super Micro UIO motherboards and servers
- Wake on LAN (WOL) support
- RoHS 6/6
- Intel PROSet Utility for Windows supported network teaming

Supported Operating Systems, Motherboards, and Servers

The AOC-SG-i2 supports the following Operating Systems (OS) with the latest BIOS:

- Windows 2000/Windows XP/Windows 2003/Windows 2008/Windows Vista
- Linux
- VMWare

Manual Images

All images and layouts shown are based upon the latest revision at the time of publishing. The card you receive not look exactly the same.

Contacting SuperMicro

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Returning Merchandise for Service

A receipt or copy of your invoice marked with the date of purchase is required before any warranty service will be rendered. You can obtain service by calling your vendor for a Returned Merchandise Authorization (RMA) number. When returning to the manufacturer, the RMA number should be prominently displayed on the outside of the shipping carton, and mailed prepaid or hand-carried. Shipping and handling charges will be applied for all orders that must be mailed when service is complete.

For faster service, RMA authorizations may be requested online (http://www.supermicro.com/support/rma/).

Whenever possible, repack the add-on card in the original Supermicro box, using the original packaging materials. If these are no longer available, be sure to pack the add-on card in an anti-static bag and inside the box. Make sure that there is enough packaging material surrounding the add-on card so that it does not become damaged during shipping.

This warranty only covers normal consumer use and does not cover damages incurred in shipping or from failure due to the alteration, misuse, abuse or improper maintenance of products.

During the warranty period, contact your distributor first for any product problems.

Chapter 1

Safety Guidelines

To avoid personal injury and property damage, carefully follow all the safety steps listed below when accessing your system or handling the components.

1-1 ESD Safety Guidelines

Electric Static Discharge (ESD) can damage electronic components. To prevent damage to your system, it is important to handle it very carefully. The following measures are generally sufficient to protect your equipment from ESD.

- Use a grounded wrist strap designed to prevent static discharge.
- Touch a grounded metal object before removing a component from the antistatic bag.
- Handle the add-on card by its edges only; do not touch its components, peripheral chips, memory modules or gold contacts.
- When handling chips or modules, avoid touching their pins.
- Put the card and peripherals back into their antistatic bags when not in use.

1-2 General Safety Guidelines

- Always disconnect power cables before installing or removing any components from the computer.
- Disconnect the power cable before installing or removing any cables from the system.
- Make sure that the add-on card is securely and properly installed on the motherboard to prevent damage to the system due to power shortage.

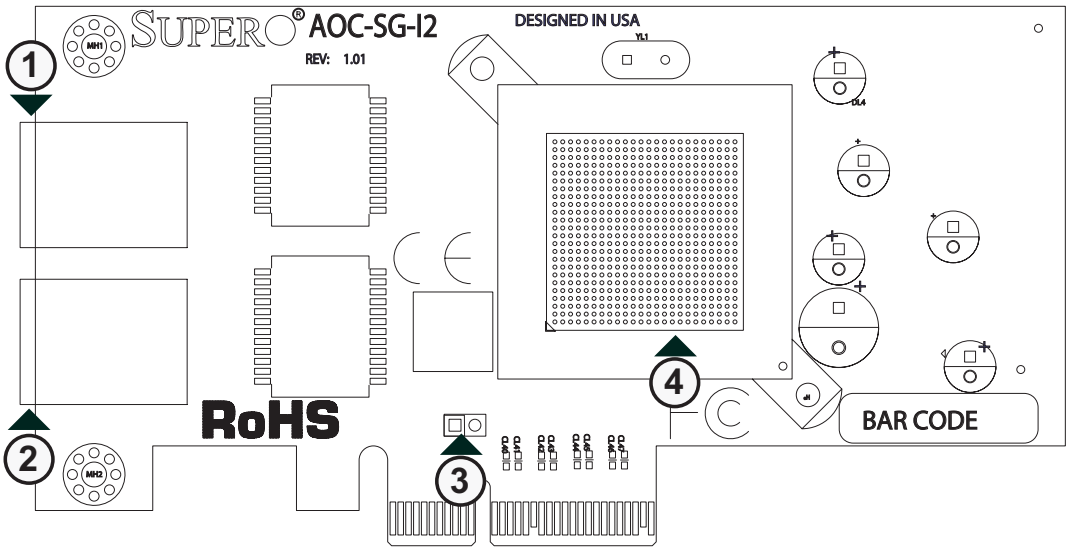
1-3 An Important Note to Users

- All images and layouts shown in this user's guide are based upon the latest PCB Revision available at the time of publishing. The card you have received may or may not look exactly the same as the graphics shown in this manual.

Chapter 2

Add-on Card Components

2-1 Front Connectors, Jumpers, and LEDs



Front Components

Components

1. LAN1 Connector Port
2. LAN2 Connector Port
3. J1 Jumper: 3.3V STBY
4. Intel 82575EB

2-2 Front Connector and Jumper Definitions

1. LAN ports

LAN ports allow the add-on card to connect to a maximum of four network cables. These are RJ45 connectors. Each LAN port provides up to one gigabit per second connection speed which require CAT6 cables for maximum throughput.

The ports are designated LAN1 and LAN2

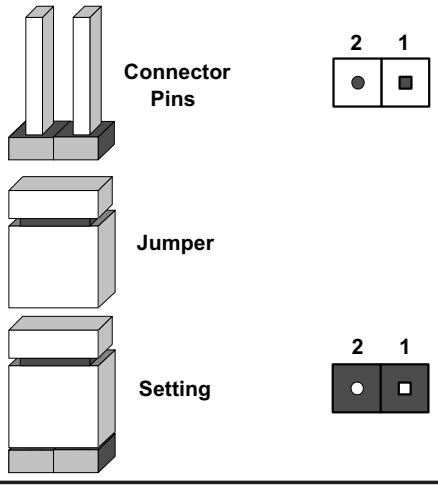
2. LAN port LEDs

Each LAN port includes two LEDs. The LEDs indicate connection speed and activity. See the table on the right for definitions of these LEDs.

LED	Color	Definition
Act	Amber (blinking)	LAN activity
LNK	Orange	Link speed at Kb/s
	Green	Link speed at 100 Mb/s
	Off	No connection or link speed at 10Mb/s

Explanation of Jumpers

To modify the operation of the backplane, jumpers can be used to choose between optional settings. Jumpers create shorts between two pins to change the function of the connector. Pin 1 is identified with a square solder pad on the printed circuit board. Note: On two pin jumpers, "Closed" means the jumper is on and "Open" means the jumper is off the pins.



3. J1 Jumper: 3.3V STBY

When properly configured, this add-on card allows Network Administrators to use STBY enabled and STBY disabled settings. In addition to configurations required by your motherboard and software, you must close the J1 jumper on the add-on card to enable this feature.

Jumper Settings		
Jumper	**Jumper Settings**	**Note**
3.3V STBY	On = Enabled	3.3V STBY enabled. (Default)

Notes

Chapter 3

Installing the Drivers

3-1 Installing the Drivers in Microsoft Windows

NOTES:

These instructions apply to all versions of Microsoft* Windows* 2000, Windows XP (including Windows XP x64 and Windows XP 64-bit Edition), Windows Vista* (including Windows Vista x64), and Windows Server* 2003 (including Windows Server 2003 x64 and Windows Server 2003 64-Bit Edition).

This will update the drivers for all supported Intel® PRO network adapters in your system.

Before installing or updating the drivers, insert your adapter(s) in the computer and plug in the network cable. When Windows discovers the new adapter, it attempts to find an acceptable Windows driver already installed with the operating system.

If found, the driver is installed without any user intervention. If Windows cannot find the driver, the Found New Hardware Wizard window is displayed.

Regardless of whether or not Windows finds the driver, it is recommended that you follow the procedure below to install the driver. Drivers for all Intel adapters supported by this software release are installed.

Driver Installation

1. If you are installing drivers from the Product CD, insert the CD. If you do not have the Product CD, download drivers from the support website and transfer them to the system.

2. If the Found New Hardware Wizard screen is displayed, click Cancel.

3. Start the autorun located on the CD. If you downloaded the software package from the support website, the autorun automatically runs after you have extracted the files.

3-2 Intel® PROSet for Windows* Device Manager

Intel® PROSet for Windows* Device Manager is an extension to the Windows Device Manager. When you install the Intel PROSet software, additional tabs are automatically added to Device Manager. You can install Intel PROSet on computers running Microsoft* Windows* 2000, Windows XP, Windows Vista*, and Windows Server* 2003, including 64-bit and x64 versions.

NOTE: You must have administrator rights to install or use Intel PROSet for Windows Device Manager.

Installing Intel PROSet for Windows Device Manager

Intel PROSet for Windows Device Manager is installed from the Product CD with the same process used to install drivers. You can select Intel PROSet for Windows Device Manager and Advanced Network Services from the Install Options dialog.

Tips for PROSet Users

If you have used prior versions of Intel PROSet, you should be aware of the following changes with Intel PROSet for Windows Device Manager:

With PROSet

1. There is no system tray icon.

2. The configuration utility is not accessible from the Control Panel or the Start menu.

3. All Intel PROSet features are now accessed from Device Manager. To access features, simply open the Device Manager and double-click the Intel adapter you would like to configure.

Removing Intel PROSet for Windows Device Manager

Use Add/Remove programs from the Control Panel to uninstall Intel PROSet for Windows Device Manager.

Receive Side Scaling

RSS must be enabled for Intel® I/O Acceleration Technology to function.

You must install Microsoft's Scalable Networking Pack (SNP) for RSS to function. Intel® PROSet will not display the RSS setting if SNP is not installed.

NOTE: The Scalable Networking Pack is part of Microsoft* Windows* Server* 2003 Service Pack 2. It is not part of SP1 and requires a separate download. See http://www.microsoft.com for more information.

RSS Configuration

RSS is enabled on the Advanced tab of the adapter property sheet. If your adapter does not support RSS, or if the SNP is not installed, the RSS setting will not be displayed.

Teaming

- If RSS is not enabled for all adapters in a team, RSS will be disabled for the team.
- If an adapter that does not support RSS is added to a team, RSS will be disabled for the team.
- If a non-Intel adapter is added to a team, RSS will be disabled for the team.
- Non-Intel adapters with RSS enabled cannot be added to a team.

3-3 Installing the Base Driver and Intel® PROSet via the Command Line

Installation Methods

The base driver install utility (SetupBD.exe) allows unattended install of base drivers from a command line.

Intel® PROSet for Windows* Device Manager is supported on Microsoft* Windows* 2000, Windows XP, Windows Vista, and Microsoft Windows Server* 2003. Use DxSetup.exe to Install PROSet for Windows Device Manager.

NOTE: Windows XP x64 and Windows Server 2003 x64 do not support unattended driver installation.

Base Driver Installation

Command Line Options

SetupBD.exe supports the following command line switches.

Switch	Description
/s	silent install with no reboot
/r	force reboot (must be used with the /s switch)
/nr	no reboot (must be used with the /s switch. This switch is ignored if it is included with the /r switch)
/u	uninstall
/infdir directory_ name	search for inf and driver files only in the specified directory

Option	Description
SetupBD	Installs and/or updates the driver(s) and displays the GUI.
SetupBD /s	Installs and/or updates the driver(s) silently.
SetupBD /s /r	Installs and/or updates the driver(s) silently and forces a reboot.
SetupBD /s /r /nr	Installs and/or updates the driver(s) silently and forces a reboot (/nr is ignored).
SetupBD /u	Uninstalls all drivers from the system.
SetupBD /infdir x:\infdir	Installs and/or updates the driver(s), looks for inf and driver files only in the specified directory

NOTE: You must include a space between switches.

NOTES:

- If you uninstall an adapter's driver from Windows Device Manager, you must reboot before using SetupBD.exe to install a new driver.
- If you install drivers on a system based on the Intel® 5000 Series Chipset, the /s switch (silent install) forces a reboot without the /r switch. If you do not want the system to reboot, use the /nr switch.
- For Intel® I/O Acceleration Technology to function properly, you must reboot after driver installation.

You can use the /r and /nr switches only with a silent install (i.e. with the "/s" option).

Intel PROSet for Windows Device Manager Installation

This section describes how to install Intel PROSet for Windows Device Manager from the command line.

NOTE: Intel PROSet can be installed with DxSetup.exe or msiexec.exe. Intel recommends using DxSetup.exe. DxSetup.exe detects the system's language, searches for the appropriate transform file, and applies it to MSI package. The transform file

translates the installation instructions to the language associated with your operating system.

Using the DxSetup.exe utility

DxSetup.exe is a setup utility used for installing Intel PROSet. It detects the system language, searches for the appropriate transform file in the same folder, and then launches PROSETDX.msi in the language specific to the operating system. The transform file translates the installation instructions to the language associated with your operating system.

Switch	Description
/q[r|n]	silent install options. r Reduced GUI Install n Silent install
/l[i|w|e|a]	log file option. i log status messages. w log non-fatal warnings. e log error messages. a log the start of all actions.

DxSetup.exe Public Properties

Switch	Description
BD	"0", deselect / do not execute SetupBD. "1", execute SetupBD to install the drivers (default setting). NOTE: BD should only be set to 0 if the Base Drivers have already been installed prior to running DxSetup.exe
ANS	"0", deselect / hide ANS. "1", select ANS (default setting).
DMIX	"0", deselect / hide Intel PROSet feature. "1", select Intel PROSet feature (default setting).

DxSetup.exe also takes the install options from the command line and applies them to the PROSETDX.msi command line installation.

DxSetup.exe command line switches:

NOTES:

The ANS property should only be set to ANS=1 if DMIX=1 is set. If DMIX=0 and ANS=1, the ANS=1 is ignored and only the base driver will be installed.

Public properties are case sensitive. All characters are uppercase with no white space between characters. For example:

DxSetup.exe /qn ANS=1

Any white space in “ANS=1” makes the setting invalid. “ans=1” is not a valid setting.

Command Line Examples

You can modify the paths for different operating systems and CD layouts and apply the command line examples.

Command Examples

1. The following launches a typical install silently:

- DxSetup.exe /qn /liew
- C:\install.log

NOTE: BD, ANS and DMIX are selected by default.

2. How to install components but deselect ANS. Set the ANS=0 in the command line:

- DxSetup.exe /qn ANS=0 /liew
- C:\install.log

msiexec.exe command line options

Refer to Microsoft's website for the most current information on msiexec.exe command line options: http://msdn.microsoft.com/library

NOTES:

- Not all command line options Microsoft provides with msiexec.exe have been tested or are necessarily supported for Intel PROSet installation.
- Msiexec also sets an error level on return that corresponds to system error codes: http://msdn.microsoft.com/library

This section describes how to install Intel PROSet for Windows Device Manager from the command line. It describes all the command line options supported in PROSETDX.msi.

NOTE: Intel PROSet can be installed with DxSetup.exe or msiexec.exe. Intel recommends using DxSetup.exe. DxSetup.exe detects the system's language, searches for the appropriate transform file, and applies it to MSI package. The transform file translates the installation instructions to the language associated with your operating system.

Command Line Switches

Switch	Description
/i	install
/x	uninstall
/q[r|n]	silent install options r Reduced GUI Install n Silent install
/l[i|w|e|a]	log file option. i log status messages. w log non-fatal warnings. e log error messages. a log the start of all actions.
Transforms	A property used to apply transforms (a .mst file) to an MSI package. The following example applies a Chinese language transform to MSI package, so the installer displays Chinese strings during installation: TRANSFORMS=2052.mst

This section describes how to install Intel PROSet using PROSETDX.msi and msiexec.exe from the command line. For more information on msiexec.exe command line parameters, refer to the msiexec.exe command line options section.

Windows Installer Service is installed by default in Windows 2000, XP32 and XP64. msiexec.exe is under System32 folder. When System32 is not in the current PATH, the full path to msiexec.exe should be specified in the command line. For example:

- C:\WINNT\System32\msiexec.exe /i
- PROSETDX.msi /qn /liew
- c:\temp\install.log

Most commonly used msiexec.exe command line options:

Silent install/upgrade command line syntax

The following launches a typical installation of PROSETDX.msi.

<Full path to msiexec.exe> /i <Full path to PROSETDX.msi> /qn /liew <Full path to install.log>

Silent Uninstall Command Line Syntax

The following uninstalls all the Intel PROSet components. It can be used when the path to PROSETDX.msi is available.

<path to msiexec.exe> /x <path to PROSETDX.msi> /qn /liew <path to uninstall.log>

Property	Definition
BD	"0", deselect / do not execute SetupBD. "1", execute SetupBD to install the drivers. NOTE: In this release, it is set to "1" by default. It is always installed by default in this release. BD should only be set to 0 if the Base Drivers have already been installed prior to running PROSETDX.msi
ANS	"0", deselect / hide ANS. "1", select ANS. NOTE: In this release, it is set to "1" by default. It is always installed by default in this release.

The following uninstalls all the Intel PROSet components. It can be used when the path to PROSETDX.msi is not available but the ProductCode of MSI package is known.

<path to msiexec.exe> /x <ProductCode of PROSETDX.msi> /qn /liew <path to uninstall.log>

Command Line Options Supported by PROSETDX.msi

PROSETDX.msi provides public properties that can be used to change Intel PROSet install selections from the command line.

By setting the properties in the command line, you can disable and hide some features in PROSETDX.msi, or force some feature to be selected/displayed. This provides the flexibility to install different components/features in Intel PROSet.

Following is the list of public properties provided by PROSETDX.msi:

NOTES:

- The ANS property should only be set to ANS=1 if DMIX=1 is set. If DMIX=0 and ANS=1, only the base driver will be installed.

- Public properties are case sensitive. All characters are upper-case with no white space between characters. For example: msiexec.exe /i PROSETDX.msi /qn ANS=1

Any white space in “ANS=1” makes the setting invalid. “ans=1” is not a valid setting.

Command line install examples

Assume that C:\WINNT\System32 is in the system32 folder and PROSETDX.msi is under the D:\Apps\PROSETDX\Win32 folder. You can modify the paths for different operating systems and CD layouts and apply the command line examples.

Command Line Examples

1. How to install Intel PROSet silently on Windows XP:

   C:\WINNT\System32\msiexec.exe /i D:\Apps\PROSETDX\Win32\PROSETDX.msi /qn /liew C:\ install.log

2. How to install Intel PROSet silently on Windows Server 2003 for Itanium®-based systems:

   C:\WINNT\System32\msiexec.exe /i D:\Apps\PROSETDX\Win64\PROSETDX.msi /qn /liew C:\ install.log

3. How to install components but deselect ANS:

Set the ANS=0 in the command line, for example:

   C:\WINNT\System32\msiexec.exe /i D:\Apps\PROSETDX\Win32\PROSETDX.msi /qn ANS=0 /liew C:\ install.log

4. How to apply a transform file to MSI using msiexec.exe:

Set the TRANSFORMS=filename.mst in the command line. For example:

C:\WINNT\System32\msiexec.exe /i D:\Apps\PROSETDX\Win32\PROSETDX.msi /qn TRANSFORMS=2052.mst /liew C:\ install.log

NOTE: Intel recommends using DxSetup.exe to install Intel PROSet. DxSetup.exe detects the system's language, searches for the appropriate transform file, and applies it to MSI package.

Command Line Uninstall Example

NOTE: Do not use the "ANS" option when uninstalling Intel PROSet from a command line.

First get the path of PROSETDX.msi in the local system or any other image path when you installed Intel PROSet, then use msiexec.exe to uninstall Intel PROSet.

For example, assume System folder is C:\Windows\System, and PROSETDX.msi is in d:\unattend, then the command line will be:

C:\Windows\System\msiexec.exe /x d:\unattend\ PROSETDX.msi /qn /liew d:\unattend\uninst.log

Command Line Reinstall/Repair

If you need to repair an Intel PROSet installation, uninstall the application and then reinstall it. See the uninstall and install examples above for more information.

Chapter 4

Linux Base Driver for PRO/1000 Family of Adapters

4-1 Overview

This file describes the Linux* Base Driver for the Intel® PRO/1000 Family of Adapters. This driver supports the 2.4.x and 2.6.x kernels. This driver includes support for Itanium® 2-based systems.

This driver is only supported as a loadable module. Intel is not supplying patches against the kernel source to allow for static linking of the driver. For questions related to hardware requirements, refer to the documentation supplied with your Intel PRO/1000 adapter. All hardware requirements listed apply to use with Linux.

This release includes support for Intel® I/O Acceleration Technology, Intel® I/OAT. This is supported on systems using the Intel® 5000 Series Chipsets Integrated Device - 1A38. You can find additional information on Intel I/OAT at http://www.intel.com/technology/ioacceleration/index.htm.

The following features are now available in supported kernels:

- Native VLANs
- Channel Bonding (teaming)
- SNMP

Channel Bonding documentation can be found in the Linux kernel source: /documentation/networking/bonding.txt

The driver information previously displayed in the /proc file system is not supported in this release. Alternatively, you can use ethtool (version 1.6 or later), lspci, and ifconfig to obtain the same information. Instructions on updating ethtool can be found in the section Additional Configurations later in this document.

4-2 Identifying Your Adapter

For more information on how to identify your adapter, go to the Adapter & Driver ID Guide at:

http://support.intel.com/support/network/adapter/pro100/21397.htm

For the latest Intel network drivers for Linux, refer to the following website. In the search field, enter your adapter name or type, or use the networking link on the left to search for your adapter:

http://downloadfinder.intel.com/scripts-df/support_intel.asp

4-3 Building and Installation

To build a binary RPM* package of this driver, run 'rpmbuild -tb <filename.tar.gz>'. Replace <filename.tar.gz> with the specific file name of the driver.

NOTES:

For the build to work properly, the currently running kernel MUST match the version and configuration of the installed kernel sources. If you have just recompiled the kernel reboot the system now.

PM functionality has only been tested in Red Hat distributions.

Building a Binary RPM Package

1. Move the base driver tar file to the directory of your choice. For example, use '/home/username/e1000' or '/usr/local/src/e1000'.

2. Untar/unzip the archive, where <x.x.x> is the version number for the driver tar file:
   tar zxf e1000-<x.x.x>.tar.gz

3. Change to the driver src directory, where <x.x.x> is the version number for the driver tar:
   cd e1000-<x.x.x>/src/

4. Compile the driver module:
   make install
   The binary will be installed as:
   /lib/modules/<KERNEL VERSION>/kernel/drivers/net/e1000/e1000.[k]o

5. The install location listed above is the default location. This may differ for various Linux distributions. For more information, go to ldistrib.htm.
   Load the module using either the insmod or modprobe command:
   modprobe e1000
   insmod e1000
   Note that for 2.6 kernels the insmod command can be used if the full path to the driver module is specified. For example:
   insmod /lib/modules/<KERNEL VERSION>/kernel/drivers/net/e1000/e1000.ko
   With 2.6 based kernels also make sure that older e1000 drivers are removed from the kernel, before loading the new module:
   rmmod e1000; modprobe e1000

6. Assign an IP address to the interface by entering the following, where <x> is the interface number:
   ifconfig eth<x> <IP_address>

7. Verify that the interface works. Enter the following, where <IP_address> is the IP address for another machine on the same subnet as the interface that is being tested:
   ping <IP_address>

4-4 Command Line Parameters

If the driver is built as a module, the following optional parameters are used by entering them on the command line with the modprobe command using this syntax:

modprobe e1000 [<option>=<VAL1>,<VAL2>,...]

For example, with two PRO/1000 PCI adapters, entering:

modprobe e1000 TxDescriptors=80,128

loads the e1000 driver with 80 TX descriptors for the first adapter and 128 TX descriptors for the second adapter.

The default value for each parameter is generally the recommended setting, unless otherwise noted.

NOTES:

For more information about the AutoNeg, Duplex, and Speed parameters, see the Speed and Duplex Configuration section in this document.

For more information about the InterruptThrottleRate, RxIntDelay, TxIntDelay, RxAbsIntDelay, and TxAbsIntDelay parameters, see the application note at: http://www.intel.com/design/network/applnots/ap450.htm.

A descriptor describes a data buffer and attributes related to the data buffer. This information is accessed by the hardware.

Parameter Name	Valid Range/Settings	Default	Description
AutoNeg	0x01-0x0F, 0x20-0x2F	0x2F	This parameter is a bit mask that specifies which speed and duplex settings the board advertises. When this parameter is used, the Speed and Duplex parameters must not be specified. This parameter is supported only on adapters using copper connections. NOTE: Refer to the Speed and Duplex section of this readme for more information on the AutoNeg parameter.
Duplex	0-2 (0=auto-negotiate, 1=half, 2=full)	0	Defines the direction in which data is allowed to flow. Can be either one or two-directional. If both Duplex and the link partner are set to auto-negotiate, the board auto-detects the correct duplex. If the link partner is forced (either full or half), Duplex defaults to half-duplex. This parameter is supported only on adapters using copper connections.
FlowControl	0-3 (0=none, 1=Rx only, 2=Tx only, 3=Rx&Tx)	Read flow control settings from the EEPROM	This parameter controls the automatic generation(Tx) and response(Rx) to Ethernet PAUSE frames.

Parameter Name	Valid Range/Settings	Default	Description
InterruptThrottleRate	(not supported on Intel(R) 82542, 82543 or 82544-based adapters) Valid Range: 0,1,3,100-100000 (0=off, 1=dynamic, 3=dynamic conservative)	3	Since 7.3.x, the driver has two adaptive modes (setting 1 or 3) in which it dynamically adjusts the InterruptThrottleRate value based on the traffic that it receives. After determining the type of incoming traffic in the last timeframe, it will adjust the InterruptThrottleRate to an appropriate value for that traffic. The algorithm classifies the incoming traffic every interval into classes. Once the class is determined, the InterruptThrottleRate value is adjusted to suit that traffic type the best. There are three classes defined: “Bulk traffic”, for large amounts of packets of normal size; “Low latency”, for small amounts of traffic and/or a significant percentage of small packets; and “Lowest latency”, for almost completely small packets or minimal traffic. In dynamic conservative mode, the InterruptThrottleRate value is set to 4000 for traffic that falls in class “Bulk traffic”. If traffic falls in the “Low latency” or “Lowest latency” class, the InterruptThrottleRate is increased stepwise to 20000. This default mode is suitable for most applications. See Note at the end of this table for more information

Parameter Name	Valid Range/Settings	Default	Description
RxDescriptors	80-256 for 82542 and 82543-based adapters 80-4096 for all other supported adapters	256	This value specifies the number of receive buffer descriptors allocated by the driver. Increasing this value allows the driver to buffer more incoming packets, at the expense of increased system memory utilization. Each descriptor is 16 bytes. A receive buffer is also allocated for each descriptor and can be either 2048, 4096, 8192, or 16384 bytes, depending on the MTU setting. The maximum MTU size is 16110. NOTE: MTU designates the frame size. It only needs to be set for Jumbo Frames. Depending on the available system resources, the request for a higher number of receive descriptors may be denied. In this case, use a lower number.

Parameter Name	Valid Range/Settings	Default	Description
RxIntDelay	0-65535 (0=off)	0	This value delays the generation of receive interrupts in units of 1.024 microseconds. Receive interrupt reduction can improve CPU efficiency if properly tuned for specific network traffic. Increasing this value adds extra latency to frame reception and can end up decreasing the throughput of TCP traffic. If the system is reporting dropped receives, this value may be set too high, causing the driver to run out of available receive descriptors. CAUTION: When setting RxIntDelay to a value other than 0, adapters may hang (stop transmitting) under certain network conditions. If this occurs a NETDEV WATCHDOG message is logged in the system event log. In addition, the controller is automatically reset, restoring the network connection. To eliminate the potential for the hang ensure that RxIntDelay is set to zero.
RxAbsIntDelay	0-65535 (0=off)	128	This value, in units of 1.024 microseconds, limits the delay in which a receive interrupt is generated. Useful only if RxIntDelay is non-zero, this value ensures that an interrupt is generated after the initial packet is received within the set amount of time. Proper tuning, along with RxIntDelay, may improve traffic throughput in specific network conditions. This parameter is supported only on 82540, 82545 and later adapters.

Parameter Name	Valid Range/Settings	Default	Description
Speed	0, 10, 100, 1000	0	Speed forces the line speed to the specified value in megabits per second (Mbps). If this parameter is not specified or is set to 0 and the link partner is set to auto-negotiate, the board will auto-detect the correct speed. Duplex must also be set when Speed is set to either 10 or 100. This parameter is supported only on adapters using copper connections.
TxDescriptors	80-256 for 82542 and 82543-based adapters 80-4096 for all other supported adapters	256	This value is the number of transmit descriptors allocated by the driver. Increasing this value allows the driver to queue more transmits. Each descriptor is 16 bytes.
TxIntDelay	0-65535 (0=off)	64	This value delays the generation of transmit interrupts in units of 1.024 microseconds. Transmit interrupt reduction can improve CPU efficiency if properly tuned for specific network traffic. If the system is reporting dropped transmits, this value may be set too high causing the driver to run out of available transmit descriptors.

Parameter Name	Valid Range/Settings	Default	Description
TxAbsIntDelay	0-65535 (0=off)	64	This value, in units of 1.024 microseconds, limits the delay in which a transmit interrupt is generated. Useful only if TxIntDelay is non-zero, this value ensures that an interrupt is generated after the initial packet is sent on the wire within the set amount of time. Proper tuning, along with TxIntDelay, may improve traffic throughput in specific network conditions. This parameter is supported only on 82540, 82545 and later adapters.
XsumRX	0-1	1	A value of '1' indicates that the driver should enable IP checksum offload for received packets (both UDP and TCP) to the adapter hardware. This parameter is not supported on the 82542-based adapter.

Notes on InterruptThrottleRate

Since 7.3.x, the driver has two adaptive modes (setting 1 or 3) in which it dynamically adjusts the InterruptThrottleRate value based on the traffic that it receives. After determining the type of incoming traffic in the last timeframe, it will adjust the InterruptThrottleRate to an appropriate value for that traffic.

The algorithm classifies the incoming traffic every interval into classes. Once the class is determined, the InterruptThrottleRate value is adjusted to suit that traffic type the best. There are three classes defined: “Bulk traffic”, for large amounts of packets of normal size; “Low latency”, for small amounts of traffic and/or a significant percentage of small packets; and “Lowest latency”, for almost completely small packets or minimal traffic.

In dynamic conservative mode, the InterruptThrottleRate value is set to 4000 for traffic that falls in class “Bulk traffic”. If traffic falls in the “Low latency” or “Lowest latency” class, the InterruptThrottleRate is increased stepwise to 20000. This default mode is suitable for most applications.

For situations where low latency is vital such as cluster or grid computing, the algorithm can reduce latency even more when

InterruptThrottleRate is set to mode 1. In this mode, which operates

the same as mode 3, the InterruptThrottleRate will be increased stepwise to 70000 for traffic in class “Lowest latency”.

Setting InterruptThrottleRate to 0 turns off any interrupt moderation and may improve small packet latency, but is generally not suitable for bulk throughput traffic

NOTE: InterruptThrottleRate takes precedence over the TxAbsIntDelay and RxAbsIntDelay parameters. In other words, minimizing the receive and/or transmit absolute delays does not force the controller to generate more interrupts than what the Interrupt Throttle Rate allows.

CAUTION: If you are using the Intel(R) PRO/1000 CT Network Connection (controller 82547), setting InterruptThrottleRate to a value greater than 75,000, may hang (stop transmitting) adapters

under certain network conditions. If this occurs a NETDEV WATCHDOG message is logged in the system event log. In addition, the controller is automatically reset,

restoring the network connection. To eliminate the potential for the hang, ensure that InterruptThrottleRate is set no greater than 75,000 and is not set to 0.

NOTE: When e1000 is loaded with default settings and multiple adapters are in use simultaneously, the CPU utilization may increase non-linearly. In order to limit the CPU utilization without impacting the overall throughput, we recommend that you load the driver as follows:

modprobe e1000 InterruptThrottleRate=3000,3000,3000

This sets the InterruptThrottleRate to 3000 interrupts/sec for the first, second, and third instances of the driver. The range of 2000 to 3000 interrupts per second works on a majority of systems and is a good starting point, but the optimal value will be platform-specific. If CPU utilization is not a concern, use RX_POLLING (NAPI) and default driver settings.

Speed and Duplex Configuration

Three keywords are used to control the speed and duplex configuration. These keywords are Speed, Duplex, and AutoNeg.

If the board uses a fiber interface, these keywords are ignored, and the fiber interface board only links at 1000 Mbps full-duplex.

For copper-based boards, the keywords interact as follows:

The default operation is auto-negotiate. The board advertises all supported speed and duplex combinations, and it links at the highest common speed and duplex mode IF the link partner is set to auto-negotiate.

If Speed = 1000, limited auto-negotiation is enabled and only 1000 Mbps is advertised (The 1000BaseT spec requires auto-negotiation.)

If Speed = 10 or 100, then both Speed and Duplex should be set. Auto-negotiation is disabled, and the AutoNeg parameter is ignored. Partner SHOULD also be forced.

The AutoNeg parameter is used when more control is required over the auto-negotiation process. It should be used when you wish to control which speed and duplex combinations are advertised during the auto-negotiation process. The parameter

Bit Position	Decimal Value	Hex Value	Speed (Mbps)	Duplex
7	128	80	N/A	-
6	64	40	N/A	-
5	32	20	1000	Full
4	16	10	N/A	-
3	8	8	100	Full
2	4	4	100	Half
1	2	2	10	Full
0	1	1	10	Half

Some examples of using AutoNeg:

modprobe e1000 AutoNeg=0x01 (Restricts autonegotiation to 10 Half)
modprobe e1000 AutoNeg=1 (Same as above)
modprobe e1000 AutoNeg=0x02 (Restricts autonegotiation to 10 Full)
modprobe e1000 AutoNeg=0x03 (Restricts autonegotiation to 10 Half or 10 Full)
modprobe e1000 AutoNeg=0x04 (Restricts autonegotiation to 100 Half)
modprobe e1000 AutoNeg=0x05 (Restricts autonegotiation to 10 Half or 100 Half)
modprobe e1000 AutoNeg=0x020 (Restricts autonegotiation to 1000 Full)
modprobe e1000 AutoNeg=32 (Same as above)

Note that when this parameter is used, Speed and Duplex must not be specified.

If the link partner is forced to a specific speed and duplex, then this parameter should not be used. Instead, use the Speed and Duplex parameters previously mentioned to force the adapter to the same speed and duplex.

4-5 Additional Configurations

Configuring the Driver on Different Distributions

Configuring a network driver to load properly when the system is started is distribution dependent. Typically, the configuration process involves adding an alias line to /etc/modules.conf or /etc/modprobe.conf as well as editing other system startup scripts and/or configuration files. Many popular Linux distributions ship with tools to make these changes for you. To learn the proper way to configure a network device

for your system, refer to your distribution documentation. If during this process you are asked for the driver or module name, the name for the Linux Base Driver for the Intel® PRO/1000 family of adapters is e1000.

As an example, if you install the e1000 driver for two PRO/1000 adapters (eth0 and eth1) and set the speed and duplex to 10full and 100half, add the following to modules.conf or /etc/modprobe.conf:

```
alias eth0 e1000
alias eth1 e1000
options e1000 Speed=10,100 Duplex=2,1
```

Viewing Link Messages

Link messages will not be displayed to the console if the distribution is restricting system messages. In order to see network driver link messages on your console, set dmesg to eight by entering the following:

```
dmesg -n 8
```

NOTE: This setting is not saved across reboots.

Jumbo Frames

Jumbo Frames support is enabled by changing the Maximum Transmission Unit (MTU) to a value larger than the default value of 1500. Use the ifconfig command to increase the MTU size. For example:

```
ifconfig eth<x> mtu 9000 up
```

This setting is not saved across reboots. The setting change can be made permanent by adding MTU=9000 to the file: /etc/sysconfig/network-scripts/ifcfg-eth<x> (Red Hat distributions). Other distributions may store this setting in a different location.

NOTES:

To enable Jumbo Frames, increase the MTU size on the interface beyond 1500.

The maximum MTU setting for Jumbo Frames is 16110. This value coincides with the maximum Jumbo Frames size of 16128.

Some Intel gigabit adapters that support Jumbo Frames have a frame size limit of 9238 bytes, with a corresponding MTU size limit of 9216 bytes. The adapters with this limitation are based on the Intel® 82571EB, 82572EI, 82573L and 80003ES2LAN controllers. These correspond to the following product names:

Intel® PRO/1000 PT Server Adapter
Intel® PRO/1000 PT Desktop Adapter
Intel® PRO/1000 PT Network Connection
Intel® PRO/1000 PT Dual Port Server Adapter
Intel® PRO/1000 PT Dual Port Network Connection
Intel® PRO/1000 PF Server Adapter
Intel® PRO/1000 PF Network Connection
Intel® PRO/1000 PF Dual Port Server Adapter
Intel® PRO/1000 PB Server Connection
Intel® PRO/1000 PL Network Connection
Intel® PRO/1000 EB Network Connection with I/O Acceleration
Intel® PRO/1000 EB Backplane Connection with I/O Acceleration
Intel® PRO/1000 PT Quad Port Server Adapter

Using Jumbo Frames at 10 or 100 Mbps may result in poor performance or loss of link.

Adapters based on the Intel® 82542 and 82573V/E controller do not support Jumbo Frames. These correspond to the following product names:

Intel® PRO/1000 Gigabit Server Adapter
Intel® PRO/1000 PM Network Connection

The following adapters do not support Jumbo Frames:

Intel® 82562V 10/100 Network Connection
Intel® 82566DM Gigabit Network Connection
Intel® 82566DC Gigabit Network Connection
Intel® 82566MM Gigabit Network Connection
Intel® 82566MC Gigabit Network Connection
Intel® 82562GT 10/100 Network Connection
Intel® 82562G 10/100 Network Connection

Ethtool

The driver utilizes the ethtool interface for driver configuration and diagnostics, as well as displaying statistical information. Ethtool version 1.6 or later is required for this functionality.

The latest release of ethtool can be found at: http://sourceforge.net/projects/gkernel.

NOTE: Ethtool 1.6 only supports a limited set of ethtool options. Support for a more complete ethtool feature set can be enabled by upgrading ethtool to ethtool-1.8.1.

Enabling Wake on LAN* (WoL)

WoL is configured through the Ethtool* utility. Ethtool is included with all versions of Red Hat after Red Hat 7.2. For other Linux distributions, download and install Ethtool from the following website: http://sourceforge.net/projects/gkernel.

For instructions on enabling WoL with Ethtool, refer to the website listed above.

WoL will be enabled on the system during the next shut down or reboot. For this driver version, in order to enable WoL, the e1000 driver must be loaded prior to shutting down or suspending the system.

NOTE: Wake On LAN is only supported on port A for the following devices:

* Intel® PRO/1000 PT Dual Port Network Connection
* Intel® PRO/1000 PT Dual Port Server Connection
* Intel® PRO/1000 PT Dual Port Server Adapter
* Intel® PRO/1000 PF Dual Port Server Adapter
* Intel® PRO/1000 PT Quad Port Server Adapter

NAPI

NAPI (Rx polling mode) is supported in the e1000 driver. NAPI is enabled or disabled based on the configuration of the kernel. To override the default, use the following compile-time flags.

To enable NAPI, compile the driver module, passing in a configuration option:

```
make CFLAGS_EXTRA=-DE1000_NAPI install
```

To disable NAPI, compile the driver module, passing in a configuration option:

```
make CFLAGS_EXTRA=-DE1000_NO_NAPI install
```

See http://www.cyberus.ca/~hadi/usenix-paper.tgz for more information on NAPI.

Disclaimer (cont.)

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Notes